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ABSTRACT

The purpose of this study was to obtain students' cognitive style profiles and obtain a record of their use of three information modes during the hypermedia lesson, "A Look Backward: An Encounter with Late Victorian Fashion." The study examined relationships among: (1) nine dimensions of cognitive style, as measured by the National Association of Secondary School Principals (NASSP) Learning Style Profile (LSP); (2) students' use of three information modes--visual images, written text, and audible descriptions; (3) computer attitude as measured by the Beliefs About Computers Scale (BACS); (4) computer anxiety as measured by the Computer Anxiety Index (CAIN); and (5) achievement. A descriptive and correlational design was used. Subjects were 79 undergraduate students enrolled in junior year classes in textiles and clothing and teacher education. Students completed the CAIN, BACS, and achievement tests before and after using the hypermedia program. The data demonstrate that students had individual cognitive styles and preferences for progressing through a lesson. The lack of more significant relationships between variables signifies that there is much variability in the way students learn. Textiles and clothing students had fewer significant correlations than did teacher education students, suggesting that their pattern of learning is harder to detect. The findings support an approach to instructional design that allows students to choose from many types of information modes. (27 references) (GL)

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Title:

A Hypermedia Lesson about 1875-1885 Costume: Cognitive Style, Perceptual Modes, Anxiety, Attitude, and Achievement

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A Hypermedia Lesson about 1875-1885 Costume: Cognitive Style, Perceptual Modes, Anxiety, Attitude, and Achievement

Cognitive Style

Cognitive style is the person's characteristic manner of receiving, processing, storing, and retrieving information (Messick, 1969). Cognitive styles are consistent individual differences in mentally organizing and processing both information and experience.

One of the problems associated with the teaching-learning process is related to determining how each learner acquires, stores, and recalls information effectively. Knowing an individual's learning style can be useful if teachers and students are aware of a student's weaknesses and strengths. Through training, a student's cognitive style can become modified and adapted (Keefe, 1985). Instruction can help individuals augment their use of perceptual modes. Perceptual alternatives such as visual images, audible statements, and verbal text may affect learners' abilities to assimilate, retain, and use information.

Cognitive style studies have historically been thought to have little practical importance for instructional designers and teachers. This is primarily because the teacher is faced with the need to design individual instruction.

Individual instruction is feasible with the use of technology. The use of hypermedia has the potential to meet individual learning style needs within one program. Hypercard Macintosh programming allows information to be presented in various forms as text, graphics, motion, animation, voice, and still frames.

Learning Style Instruments

Researchers have attempted to measure students' information-processing habits by using learning style tests. Generally, these instruments have been quite limited in their ability to measure these complex behaviors. For instance, the Group Embedded Figures Test (GEFT), developed by Witkin (1950) has been widely used to assess one cognitive dimension: field independence vs. dependence (Keefe, 1987). One-dimensional learning style instruments led to the development of multi-dimensional learning style tests, providing a more comprehensive assessment of learning style. A multi-dimensional test, the National Association of Secondary School Principals' (NASSP) Learning Style Profile (LSP) includes twenty-three independent constructs within three areas: cognitive style, affective style, and physiological style (Keefe and Monk, 1988). Within the cognitive component, nine general information-processing dimensions are included: analytic, spatial, discrimination, categorization, sequential, memory skills, visual perception, auditory perception, and emotive response.

Hypercard and Videodisc

Instruction can be designed to accommodate individual differences. The interactive videodisc and computer system possesses some distinct characteristics that permit multiple modes of delivering information. The videodisc and computer lesson is able to deliver information in random order, at a variable pace, with multiple sensory

learning.

Instruction via videodisc and computer allows students to gather information from various modes (visual, verbal, audible). Hypercard programs enable learners to control a lesson giving the students the power to choose the sequence, pace, perceptual mode, and the content of the lesson. Hypercard has a feature called buttons which are sensitive areas on the page units of the computer screen. When the Macintosh mouse is clicked on a button, a predetermined action is performed, such as showing a videodisc image, or playing a pre-recorded narration. Since computers can accurately count each selection chosen by a learner, computers are a viable way to investigate individuals' information-processing habits.

An interactive videodisc-Hypercard computer lesson, A Look Backward: An Encounter with Late Victorian Fashion was designed to allow students to choose from three modes of receiving information: seeing, hearing, and reading. The computer screen shows the text and the commands that allow the learner to gain access to information. A second screen, a TV monitor, displays a video image.

The current research attempted to discover which perceptual modes students used to receive new information. Written words, visual images, and spoken words are included in the study.

Computer Attitude

Keefe (1979) defined affective styles as motivational processes that are the learners' typical modes of directing and sustaining behavior. A computer attitude test, Beliefs About Computers Scale (BACS), was developed by Ellsworth and Bowman (1982). Computer attitude referred to a person's feelings about societal use and individual use of computers. The test consisted of 17 statements which are rated on a Likert scale of one to six.

Computer Anxiety

Computer anxiety is defined as the fear or apprehension felt by an individual when using computers, or when considering the possibilities of using a computer (Simonson, et. al., 1987). A Computer Anxiety Index (CAIN) was designed to identify students who had computer-related anxieties, so that steps could be taken to reduce anxiety and improve achievement.

Maurer and Simonson (1984) reported that an individual with high anxiety would avoid computers, use computers with great caution, and talk negatively about computers and computing. According to Simes and Sirky (1985), some people experience stress during an interactive lesson. Anxiety affects performance in cognitive processes.

Purpose

The purpose of this study was to obtain students' cognitive style profiles and obtain a record of students' use of three information modes during a hypermedia lesson. This study examined relationships among 1) nine dimensions of cognitive style as measured by a standardized learning style test, 2) students' use of three information modes (visual images, written text, and audible descriptions) during a hypermedia

lesson, 3) computer attitude, 4) computer anxiety, and 5) achievement.

Research Questions

1. What are the dominant dimensions of cognitive learning style for the total sample and two subgroups: college students in teacher education classes and textiles and clothing classes?

2. What are the relationships among these variables: 1) cognitive learning style, 2) use of information modes in a hypermedia program, 3) computer anxiety, 4) computer attitude, 5) prior knowledge, and 6) achievement?

Research Design

A descriptive and correlational design was used for the study. Fifteen variables were examined, including cognitive style dimensions, prior knowledge and achievement of 1875-1885 costume, computer anxiety and computer attitude (both before and after the lesson).

Subjects were seventy-nine undergraduate students enrolled in junior year classes: textiles and clothing, and teacher education. Forty-two students were in the textiles and clothing class and thirty-seven students were in the teacher education class.

Five instruments were used to collect data: 1) NASSP Learning Style Profile, 2) A Look Backward: Victorian Fashions, a hypermedia program, 3) CAIN, 4) BACS, and 5) achievement tests. Valid and reliable measures were used.

Students completed the NASSP Learning Style Profile test which was used to assess cognitive and perceptual dimensions of learning. These dimensions diagnosed strengths and weakness of each individual's general approach to processing information. The test consisted of cognitive tasks to complete rather than Likert scale ratings. The performance on the NASSP Learning Style Profile was compared to their performance in the hypermedia program.

The perceptual response subscales: visual, auditory, and emotive measure students' initial reactions to a list of 20 words by mentally "seeing" a picture (visual); by mentally "hearing" the word (auditory); or by sensing an emotive (emotive). The emotional response may involve a physical reaction, such as taking notes, or an initial positive or negative attitude toward the word. The relationship between cognition and emotion is being examined by researchers since the "meaningfulness" of learning may be connected with affective and psychological aspects.

Each subject scheduled a one-hour session to use the hypermedia lesson, A Look Backward: Victorian Fashions. The Hypercard computer and videodisc lesson enabled the subjects to choose among three information modes: visual, verbal, and auditory information. Visual images were available in both line drawings and detailed illustrations from a videodisc. Verbal descriptions about each costume were written and read on the computer screen. Audible descriptions of each costume could be heard through the speakers of the Macintosh computer. Objectives were given and the students chose modes of information to accomplish them.

An important feature of the hypermedia lesson was its ability to track students' progress. Hypercard counted the students' choices made during the program; 1) visual

images, 2) text descriptions, and 3) audio descriptions.

Students completed tests: 1) the Computer Anxiety Index (CAIN), Beliefs About Computer Scale (BACS), and 3) achievement tests. These tests were given before and after the students used the hypermedia program. The CAIN test was selected to measure computer anxiety. The twenty-six item survey is reliable and valid (Simonson et al., 1987). Normative data was available, the average score was 60.23 (Simonson et al., 1987).

The computer attitude test, BACS, (Ellsworth & Bowman, 1982) was used also. It had a reliability of 0.77.

Results

Descriptive statistics, t-tests, and correlations were calculated. T-tests were used to compare the differences between students enrolled in the two classes. The Pearson's product moment correlation was used to identify relationships between variables.

Results and Interpretation Related to Research Question # 1

Students' received a score for each of the nine cognitive style dimensions as measured by the NASSP Learning Style Profile (see Table 1). The subjects average scores showed analytic, spatial, and categorization skills as the strongest. The weakest skills were audio response and discrimination skills. Nine t-tests were calculated to determine differences between the teacher education and textiles and clothing classes' scores. Significant differences were found for two dimensions: sequential processing and emotive. The teacher education class had stronger sequential processing skills than the textiles and clothing class. However, the textiles and clothing class had stronger emotive responses than the teacher education.

Pearson correlation coefficients were calculated for each of the nine cognitive dimensions (see Table 2) and the results did not indicate that these dimensions duplicated one another. The results signify that the nine dimensions are independent constructs.

Results and Interpretation Related to Research Question # 2

Descriptive Statistics

Information modes Students chose among three modes (visual images, auditory statements, and written descriptions) in order to receive information while using the hypermedia program. The computer counted the students' choices of each of these information modes. The frequency counts were changed to percentages. The results of their choices are given in the following paragraphs.

Use of Visual Images Statistical results showed that students' average percentage for choosing visual images was 55.89 % of the time. Visual images were chosen more often than either text or audio modes. The teacher education class used significantly ($p<.03$) more visual images than the textiles and clothing class (see table 3).

Use of Text Statistical results showed that students chose written descriptions in the hypermedia program on an average of 29.44% of the total selections. No significant differences were found between the teacher education and textiles and clothing students' use of text in the lesson.

Use of Audio Students used audio the least of the three information modes. Audio was used 14.67 % of the time. No significant differences occurred between the two groups of subjects.

Computer Anxiety The results of the CAIN were an average score of 60.25 for the first test and 59.53 for the re-test. The analysis indicated significant statistical differences ($p<.0003$) between the teacher education and textiles and clothing classes' level of anxiety. Little change occurred between the first and second administration of the test. The first test averages were 51.86 and 67.47 for teacher education and textiles and clothing, respectively. A higher score indicated a higher level of computer anxiety. These scores were compared to the norm score 62.33 (Simonson et al., 1987). The textiles and clothing class seemed to experience more computer anxiety than the norm group and the teacher education class.

Computer Attitude The computer attitude test, BACS (Ellsworth and Bowman, 1982), was given before and after the hypermedia program. The time lapse between the tests was less than two weeks. No significant change occurred between test scores. The re-test average score was 41.51. A low score indicated a more positive attitude toward computers than did a high score. The possible range of scores was from 17 to 102.

A statistically significant difference ($p<.01$) was found between the groups (average scores of 38.57 and 44.17 respectively for teacher education and textiles and clothing). Textiles and clothing students had the higher average score, indicating that they had a less favorable attitude toward computers.

Achievement Achievement was considered secondary in importance to the choices of information modes examined in this study. The process of learning was of greater interest to this study than the achievement. The achievement test measured learning that occurred within 20 minutes. The time was limited because of administrative reasons and also to encourage students to be efficient in learning (choosing most effective informational modes for their learning style). Within this limited time, students increased their scores from 47% to 63% even though more time was probably needed for higher levels of learning to occur. No significant differences were found between the students from the two groups' average scores on the pretest or the posttest.

Correlation Analysis

Pearson correlation coefficients were calculated for each of the tests. Correlation coefficients were computed to determine whether a relationship existed between scores for each variable.

Results of the correlation analysis showed significant positive correlations that had p-value of .01 or less (refer to Table 4). Probably the two most important statistically significant correlations are as follows. The analytic skill (measured by the

NASSP Learning Style Profile) and text mode scores (measured by hypermedia program) correlated ($r=.33$, $p<.01$). Also, analytic skill correlated with achievement ($r=.42$, $p<.01$).

This means that a slight relationship between students with stronger analytic skills and their use of text during a hypermedia lesson. In an analysis of variance test it was found that students with strong analytic skills were more likely to use text than the students with average analytic skills.

In general, the higher the analytic score, the higher the achievement score. An analysis of variance was conducted on achievements scores for three groups of analytic skill (strong, average, weak). There was a significant interaction between the scores. Students with strong analytic scores were more likely to have higher achievement scores than students with average analytic scores.

Conclusions

These findings have implications that are especially important in educational settings. The data demonstrate that students had individual cognitive styles and preferences for progressing through a lesson. The lack of more significant relationships between variables signifies that there is much variability in the way students learn. Textiles and clothing students had fewer significant correlations than teacher education. This means that their pattern of learning is harder to detect. Perhaps this supports instructional design that allows students to choose from many types of information modes.

Identifying learning styles is important in order to provide for the needs of a diverse student population. To identify students' learning styles, select reliable and valid learning style instruments. The NASSP Learning Style Profile seemed to be valid for college students, although normative data was available only for college freshman and not for junior and senior year students. Included in the nine cognitive dimensions were three perceptual modes (visual response, audio response, and emotive). The NASSP Learning Style Profile derived its perceptual mode test from a more indepth instrument, the ELSIE test (Reinert, 1976). In the future I would suggest using the ELSIE test for adults. It is a reliable and valid test for measuring how language is learned and conceptualized. Since this test more be more thorough in assessing the students' perceptual responses, perhaps a significant correlation would occur between the use of information modes that they use in a lesson.

In this study, three information modes (visual images, text descriptions, and audio statements) were available to students as they worked through a hypermedia lesson. These information modes were a measure of what type of format was used most often in learning about historic costume. This performance measure was used to examine learning style consistency. The visual mode assessment appeared to be consistent between two scores: 1)the visual response score of the NASSP Learning Style Profile and 2) the percentage of visuals used in the hypermedia lesson. In the NASSP Learning Style Profile, students visual response score was the highest average of the three modes. Similarly, students' used visual images most often while using the hypermedia lesson. However, in the correlation analysis, the two measures did not correlate significantly . In fact, no significant relationships were found for the correlations of the three perceptual modes (visual, audio, and emotive response) as measured by the NASSP Learning Style Profile and the three process variables as

measured by the hypermedia lesson.

Possible reasons for the lack of significant relationships between the performance in the hypermedia lesson and the performance of three dimensions in the NASSP Learning Style Profile were as follows: 1) the exploratory nature that students may have used to approach the hypermedia lesson, 2) the lack of credit toward a course grade, 3) the diagnostic level rather than indepth level instrument of the NASSP Learning Style Profile to measure visual, audio, and emotive response, and 4) students' perceptual response scores on the NASSP Learning style profile were "average", although the visual response score was a "strong-average" and the audio response score was "weak-average".

Students' profile of nine cognitive learning skills showed "average" ratings for all nine dimensions, although some skills were "weak-average", "mid-average", and "strong-average". Further research can investigate the interaction of individual's cognitive scores and students' choice of information modes, attitudes, and achievement. The sample should be stratified sample consisting of an equal number of students in three groups ("weak", "average", and "strong") for each of the nine cognitive skills. Statistical tests could analyze the difference between the group means (weak, average, strong) and indicate if there is an interaction between the dependent and independent variable.

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